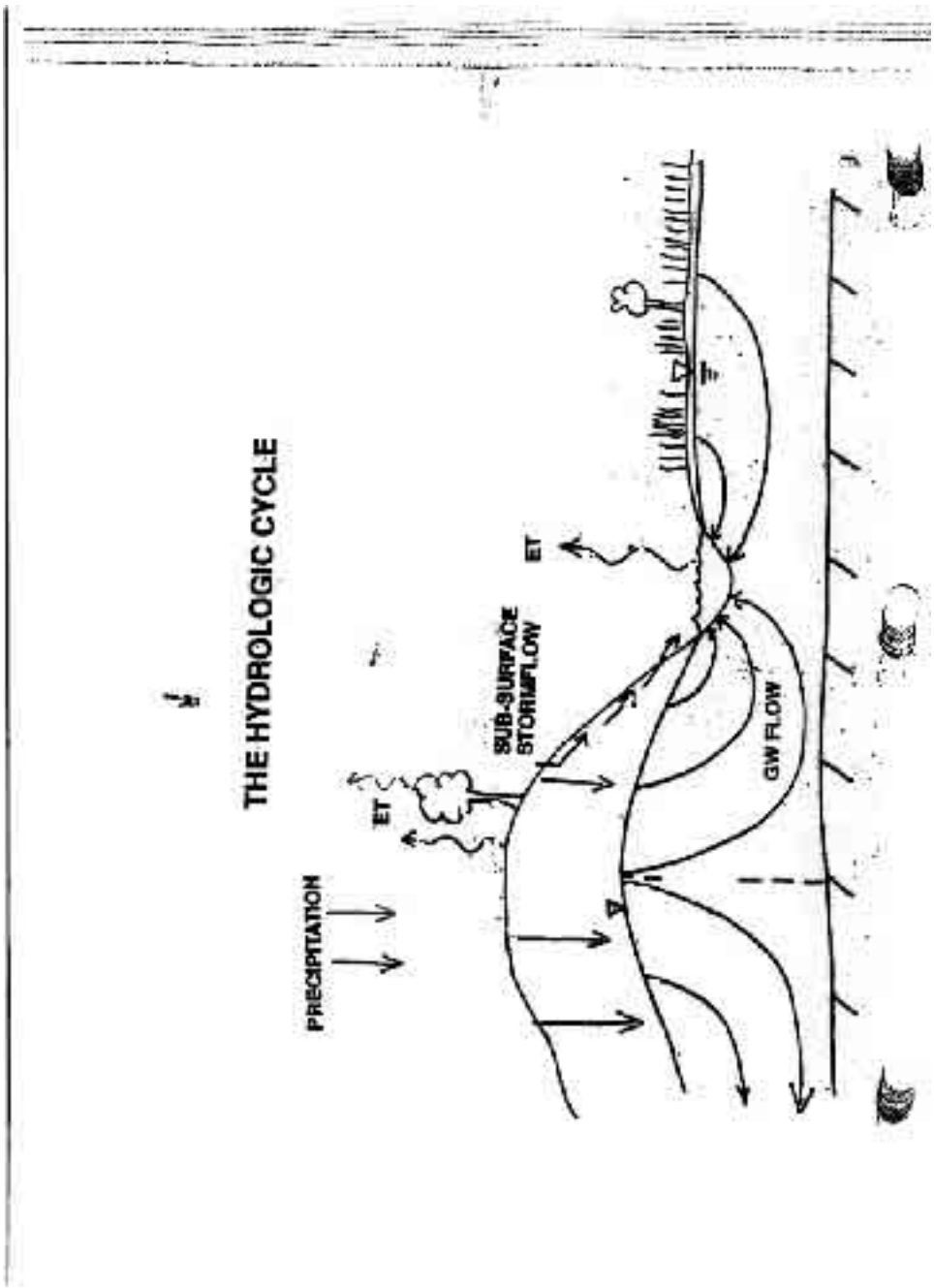
Groundwater Hydrology for Site Evaluators

Prepared by U.S. Geological Survey Water Resources Division

1. The hydrologic cycle
2. Types of Groundwater flow systems
3. Factors controlling depth to water table
4. USGS method for estimating probable high groundwater levels in Massachusetts
5. Monitoring well installation



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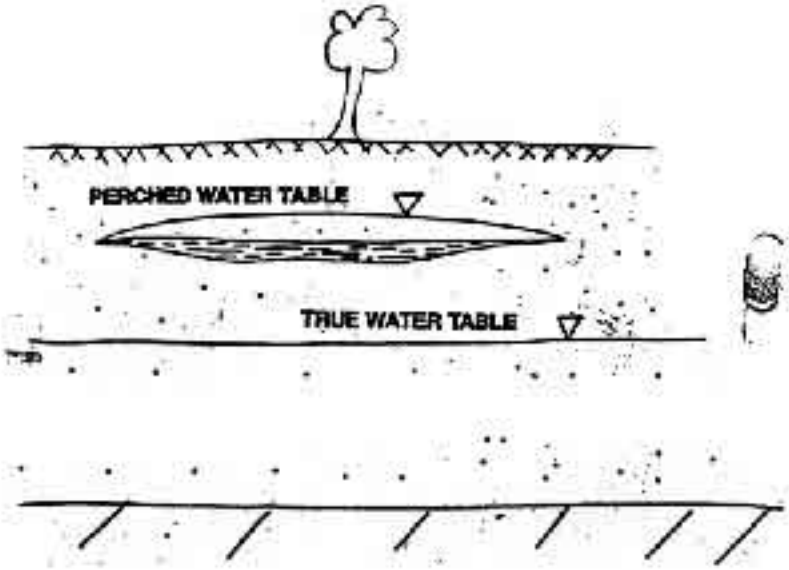
A SPECIAL CASE OF THE UNCONFINED SYSTEM: PERCHED GROUND-WATER



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GROUND-WATER FLOW SYSTEMS:
CONFINED
RECHARGE AREA
TILL
SAND
DELTA
POTENTIOMETRIC SURFACE
GLACIAL LAKE CLAY
BEDROCK

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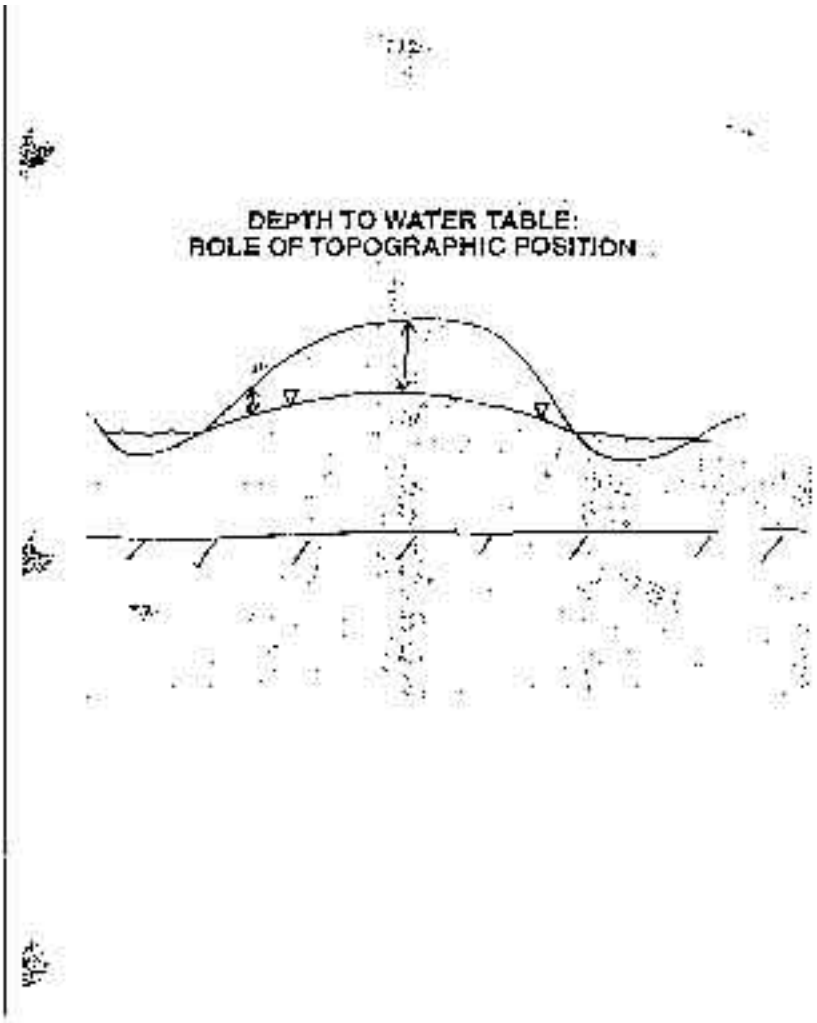
Depth to water Table:
A Key Variable in Site Evaluation

Controlled by:

1. Topographic position (position in the groundwater flow system);

2. Surficial geology;

3. Season of the Year.



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DEPTH TO WATER TABLE:
ROLE OF SURFICIAL GEOLOGY
(SOIL TYPE)

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Depth to Water Table:
Seasonal Change

In general, in Southern New England:

October- May is the recharge season, when P> ET and excess soil moisture becomes ground water recharge.

May – October is the growing season. Because of root demand, ET _> P, and little or no recharge can occur.

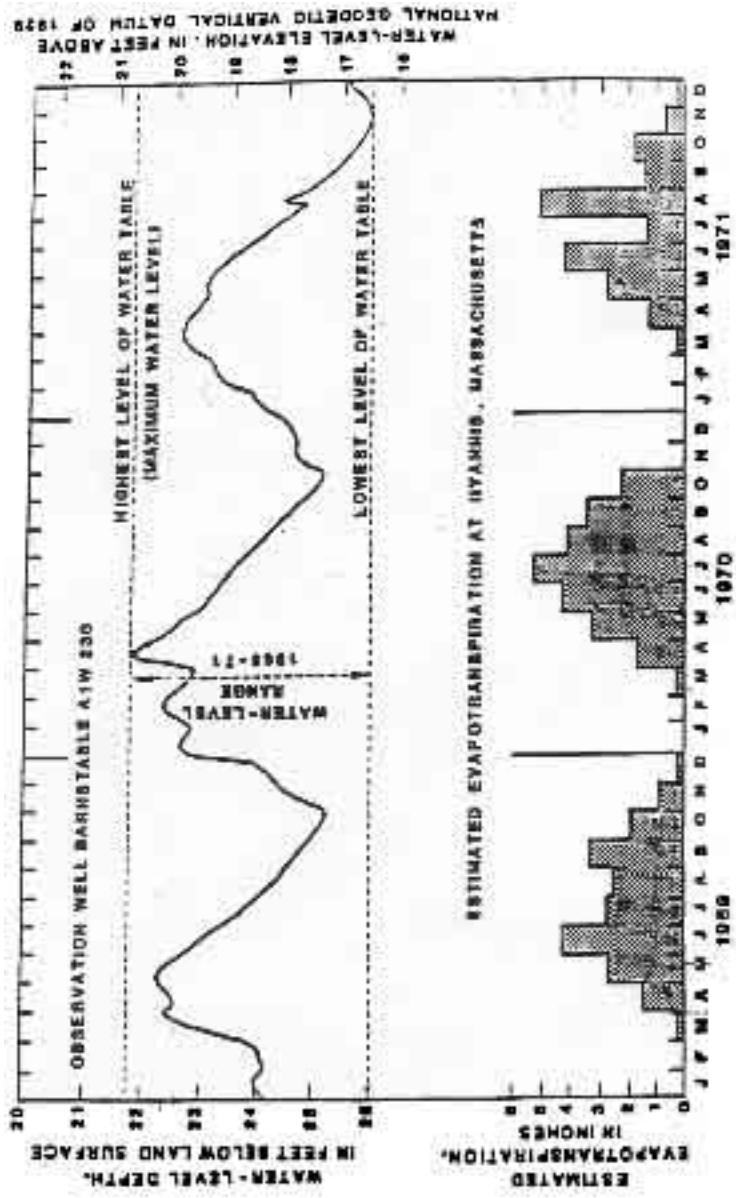

Fig. 1 Seasonal water-level fluctuations in the USGS Barnstable 230 observation well for the years 1969 through 1971. (source: Pringuer, 1981)

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USGS Method for Estimating Probable High Groundwater levels

It is possible to establish a correlation between probable water-level change at any given site and measured changes at a nearby, long-term observation well site, located in a similar geologic and topographic setting.

Reference: Frimpter, M.H., 1981. Probable high ground-water levels in Massachusetts, USGS Open-File Report 80-1205.

GOVERNING EQUATION

or, $$(S_c - S_h)/S_r = (OW_c - OW_{max})/OW_r$$

or, $$S_c - S_h = S_r(OW_c - OW_{max})/OW_r$$

Note: S_c is measured at site
S_r can be estimated for site (see p. 12)
OW_c comes from USGS "Current Conditions"
OW_{max} and OW_r from well USGS well records.

potential rise at site/water-level range at site =
potential rise at well/water-level range at well